THE SPEED OF ADJUSTMENT IN WORKING CAPITAL REQUIREMENT

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Abstract

This paper analyzes the determinants of working capital requirement and examines the speed with which firms adjust toward their target working capital requirement. The findings indicate that firms adjust relatively quickly, which supports the hypothesis that current balance sheet items are easier to manipulate and could be changed quite easily, even in the short run. Moreover, we find that the speed of adjustment is not equal across all firms and varies according to their external finance constraints and their bargaining power. Firms with better access to external capital markets and greater bargaining power adjust faster due to their lower costs of adjustment.

Keywords: Working capital management; Working capital requirement; Net trade cycle; speed of adjustment; heterogeneity.

Acknowledgements The authors gratefully acknowledge the helpful comments and suggestions received during the editing/review process. We also acknowledge financial support from *Fundación CajaMurcia*

Post-print version
Baños-Caballero, S., García-Teruel, P. J. and Martínez-Solano, P., The speed of adjustment in working capital requirement, ***European Journal of Finance*** 19, 978-992, (*doi.org/10.1080/1351847X.2012.691889*)

The speed of adjustment in working capital requirement

1. Introduction

Since Smith (1980) suggested that working capital management is important because of its effects on a firm's profitability and risk, and consequently its value, the literature on working capital management has developed through empirical contributions. In particular, some more recent studies have focused on how investment in working capital affects a firm's performance (Jose et al., 1996; Shin and Soenen, 1998; Deloof, 2003; Padachi, 2006; García and Martínez, 2007; Raherman and Nasr, 2007; among others), while a more scant literature analyze the empirical determinants of this investment (Chiou, Cheng and Wu, 2006; Hill, Kelly and Highfield, 2010; and Baños, García and Martínez, 2010).

The current assets and liabilities represent an important share of items on a firm's balance sheet. Using a sample of Spanish firms, we find that the median value of current assets (current liabilities) to total assets is 50.3% (34.8%). The median value of working capital requirement (WCR), defined as the sum of accounts receivable and inventories net of accounts payable, to total assets is 21.2%. Given the importance of operating assets and liabilities for firms, there is a growing literature analyzing firms' short-term investment and financing decisions.

Although the most previous studies focus on the determinants of individual components of WCR (accounts receivable, inventories and accounts payable), Hill et al., (2010) indicate that operating assets and liabilities must be ultimately managed jointly rather than individually. Accordingly, this paper integrates the individual components to analyze the determinants of investment in WCR. In particular, following Shin and

Soenen (1998) we use the Net Trade Cycle (NTC) as a measure of WCR, which is calculated by the following expression: NTC= (accounts receivables/ sales)*365 + (inventories/sales)*365 - (accounts payable/sales)*365. It indicates the number of "sales days" the firm has to finance its working capital requirement (Shin and Soenen 1998), where the longer this cycle, the larger the WCR.

Unlike previous studies, using a partial adjustment model, we analyze the speed with which firms adjust toward their target WCR. Moreover, this paper also examines whether this speed of adjustment depends on a firm's characteristics such as its access to external finance and market power. To our knowledge, this is the first paper to carry out these analyses.

Our findings indicate that firms have a target WCR and that they adjust their current level to their target gradually over time because of adjustment costs. Moreover, we find that firms adjust relatively quickly, which supports the idea that current balance sheet items are easier to manipulate and, hence, could be changed quite easily, even in the short run. Finally, our findings indicate that the speed of adjustment is not equal across all firms and that firms with better access to external finance and greater bargaining power adjust more quickly, indicating that their costs of adjustment are low compared to the costs of being off their targets.

The remainder of this paper is organized as follows. The next section discusses substantive issues related to target WCR and adjustment costs. In section 3 we describe the empirical model, the method used to estimate the model and the data. Our results are presented in section 4. Section 5 then extends the model in Section 3 to test whether external finance constraints and bargaining power affect adjustment speed. Finally, the main conclusions are presented in Section 6.

2. Theoretical framework and hypotheses

Lee and Wu (1988) and Peles and Schneller (1989) suggest that firms have target current balance sheet items. Specifically, they employ a partial adjustment model to show that financial ratios involving current balance sheet items are sufficiently important to provoke management or markets into a continuous adjustment.

Larger WCR may positively affect firms' performance for two reasons. First, it may increase firm's sales (Blinder and Maccini 1991; Smith 1987; Emery 1987; Deloof and Jegers 1996; Petersen and Rajan 1997; and Ng, Smith and Smith 1999). Second, firms can get important discounts for early payments by reducing their supplier financing (Ng et al., 1999; and Wilner, 2000). However, greater WCR also has costs. On the one hand, since a larger WCR needs to be financed, it may lead to more interest expenses and credit risk, which might also lead companies to bankruptcy (Soenen, 1993). On the other hand, keeping stock available also supposes costs, such as warehouse rent and security expenses, which tend to rise as inventories increase (Kim and Chung, 1990).

Accordingly, we expect that firms have a target WCR. However, a firm's current WCR may not always equal its desired WCR for several reasons. Nadiri (1969), for instance, suggests that firms cannot always estimate their sales accurately and with certainty, and hence neither their purchases; they do not accurately anticipate changes in monetary policy or in the rates of default and bad debts on their trade credit; and the discovery and collection of delinquent accounts takes time and involves costs, which may be distributed over time. Peles and Schneller (1989) also suggest that firms might deviate from their target because of random or other temporary shocks, changes in the costs of

production factors, or due to improvements in technology. Management should then take the appropriate steps to achieve the target WCR.

Peles and Schneller (1989) suggest that current balance sheet items are to a large extent under the firm's control and, hence, they are easier to manipulate and could be changed quite easily, even in the short run. However, we do not expect adjustment toward the target WCR to be immediate, because of costs of adjustment. Firms will adjust their WCR only if the benefits of doing so more than offset the costs of reducing the firm's deviation from target WCR.

WCR can be adjusted by modifying the accounts receivable, inventories or accounts payable. A greater WCR needs to be financed and, hence, it might lead to more interest expenses and credit risk. On the contrary, a lower WCR could be detrimental to the sales of the firm. Accordingly, we expect that speed of adjustment is not equal across all firms and depends on both the external finance constraints of a firm and its market power.

Since changes in WCR may be associated with changes in a firm's external finance, we expect faster speeds of adjustment for firms with a better access to external capital markets. To the extent a firm has better access to capital markets it could more easily modify its investment in accounts receivables and inventories as well as its received trade credit. Similarly, firms with greater market power can also modify their WCR more easily, for two reasons (Hill et al., 2010). First, they can extend the credit terms received from their suppliers and hold less inventory with little repercussion on their relationships with suppliers. Second, firms with a greater market power can reduce the terms of trade credit granted to their customers without paying a large penalty in terms

of a drop in sales. Thus, we expect also to see higher rates of adjustment for companies with both greater access to external finance and greater bargaining power.

3. Method and Data

3.1. *Method*

To analyze the determinants of WCR and how firms modify their WCR to move toward their target, this paper uses the following standard partial adjustment model:

$$NTC_{i,t} - NTC_{i,t-1} = \gamma\,(NTC^{*}_{i,t} - NTC_{i,t-1}) \quad 0 < \gamma < 1 \tag{1}$$

where $NTC_{i,t}$ is the Net Trade Cycle in the period t, and $NTC^{*}_{i,t}$ is the target Net Trade Cycle. We use the NTC as a proxy for a firm's WCR. Specification (1) implies that firms may face costs of adjustment that may prevent immediate adjustment to a firm's target. The coefficient γ measures the speed of adjustment, which is inversely related to adjustment costs, and takes values between 0 and 1. If $\gamma = 0$, then $NTC_{i,t} = NTC_{i,t-1}$, and the current Net Trade Cycle remains as in the previous period, indicating that companies bear high adjustment costs. If, in contrast, $\gamma = 1$, then $NTC_{i,t} = NTC^{*}_{i,t}$, and firms immediately adjust their Net Trade Cycle to their targets.

To model a target NTC, we use a set of variables that appear regularly in the literature as determinants of a firm's WCR (Hill et al., 2010; and Baños et al., 2010). The variables and their expected effects on the target NTC are as follows:

CFLOW: The preference for funds generated internally (Myers, 1984) and the possible credit rationing (Greenwald, Stiglitz, and Weiss, 1984) due to asymmetric information and agency costs might affect the level of a firm's investment and, hence, its WCR. A

positive cash flow allows firms to finance a positive WCR and, hence, we expect the capacity to generate internal funds to influence NTC positively. This variable is defined as the ratio of earnings before interest and tax plus depreciation to sales.

FCOST: We expect firms with a higher cost of external finance to hold a smaller NTC, since they have to pay a greater interest rate to borrow and, hence, the cost of funds invested in WCR is higher. The *cost of external finance* is measured by two proxies. The first ($FCOST_1$) is calculated by the ratio interest expenses/(total debt - accounts payable). In the second ($FCOST_2$), we do not eliminate accounts payable from the total debt.

GROWTH: Firms with high growth opportunities use more trade credit as a source of financing (Petersen and Rajan, 1997; and Cuñat, 2007) and tend to grant less trade credit to their customers (Molina and Preve, 2009). Thus, we would expect these companies to have a lower WCR. We also use two proxies to measure the growth opportunities. $GROWTH_1$ is calculated by the ratio market-to-book value of assets ((market value of equity + book value of debt) / total assets), while $GROWTH_2$ is defined as the ratio market-to-book value of equity (market value of equity / book value of equity).

SIZE: Larger firms suffer less severe asymmetric information between insiders and outsiders (Jordan, Lowe and Taylor 1998; and Berger, Klapper, and Udell 2001) because more public information is available to them. As a consequence, they have better access to capital markets and may find it easier to finance a positive WCR. Thus, size would be expected to positively influence WCR. However, because of their lower reputations, smaller firms have to extend more credit to guarantee their products (Long, Malitz, and Ravid 1993; Lee and Stowe 1993; and Pike, Cheng, Cravens and

Lamminmaki 2005) and they are offered less trade credit (Niskanen and Niskanen 2006), which might cause them to increase their WCR too. Since these various considerations lead to opposite conclusions on the expected effect of size on WCR, the expected relationship is not clear. This variable is proxied by the natural logarithm of assets.

FA: Investment in fixed assets might compete with the WCR for a firm's capital when firms operate under imperfect capital markets, as reported by Fazzari and Petersen (1993), so a negative relationship between these variables might be expected. The investment in fixed assets of the firm is measured by the ratio tangible fixed assets over total assets[1].

ZSCORE: The costs of financial distress arise when the firm cannot meet its payment obligations in either the short or long term. This can affect the WCR of firms, since companies with a greater probability of financial distress have more difficulties obtaining capital and, hence, are expected to have a lower WCR. The likelihood of financial distress (ZSCORE) is calculated according to the re-estimation of Altman's (1968) model carried out by Begley, Mings, and Watts (1996), where a higher ZSCORE implies a lower probability of insolvency[2].

PRO: It is known that firms with a higher profitability can obtain funds more easily, but they also tend to receive significantly more credit from their suppliers (Petersen and Rajan 1997) and hold lower finished goods inventories (Blazenco and Vandezande 2003). In contrast, firms facing profitability problems tend to increase trade credit receivable prior to entering financial distress (Molina and Preve 2009). Thus, we expect firms with a greater profitability to hold a lower WCR. The ratios earnings before

interest and taxes over total asset (PRO_1) and earnings before interest and taxes over sales (PRO_2) are used in our analysis as proxies for this variable.

GDP: The growth of Gross Domestic Product, which affects accounts receivable (Smith 1987; and Walker 1991), inventories (Blinder and Maccini 1991; Carpenter, Fazzari, and Petersen, 1994; and Kashyap, Lamont, and Stein, 1994), and accounts payable (Nilsen 2002) could also be a determinant of a firm's WCR.

Accordingly, a firm's target Net Trade Cycle is estimated by:

$$NTC^*_{i,t} = \beta_0 + \beta_1 CFLOW_{i,t} + \beta_2 FCOST_{i,t} + \beta_3 GROWTH_{i,t} + \beta_4 SIZE_{i,t} + \beta_5 FA_{i,t} + \beta_6 ZSCORE_{i,t} + \beta_7 PRO_{i,t} + \beta_8 GDP + \varepsilon_{i,t} \quad (2)$$

where $\varepsilon_{i,t}$ is a random disturbance and β_k are the unknown parameters to be estimated. Substituting equation (2) into equation (1) and including the unobservable heterogeneity and the industry dummy variables, the current NTC is determined by:

$$NTC_{i,t} = \alpha + \rho NTC_{i,t-1} + \delta_1 CFLOW_{i,t} + \delta_2 FCOST_{i,t} + \delta_3 GROWTH_{i,t} + \delta_4 SIZE_{i,t} + \delta_5 FA_{i,t} + \delta_6 ZSCORE_{i,t} + \delta_7 PRO_{i,t} + \delta_8 GDP + \eta_i + \lambda_i + \upsilon_{i,t} \quad (3)$$

where $\alpha = \gamma\beta_0$; $\rho = (1-\gamma)$; $\delta_k = \gamma\beta_k$; *and* $\upsilon_{i,t} = \gamma\varepsilon_{i,t}$

Parameter η_i is the unobservable heterogeneity or the firm's unobservable individual effects. The variable λ_i is a dummy variable to control for industry effects. Finally, parameters $\upsilon_{i,t}$ are random disturbances.

We use the panel data methodology to estimate our model for two reasons. First, it allows us to control for unobservable heterogeneity and, therefore, eliminate the risk of

obtaining biased results arising from this heterogeneity (Hsiao 1985). Second, panel data also allows us to avoid the problem of possible endogeneity, which appears evident in our analysis, as several studies have shown. In particular, previous literature shows that working capital management might also affect profitability (Jose et al. 1996; Shin and Soenen 1998; Deloof 2003; and Garcia and Martinez 2007) and firms' sales (Smith 1987; Emery 1987; Deloof and Jegers 1996; Petersen and Rajan 1997; and Ng et al. 1999). If we do not control for endogeneity, it might affect the estimation results. We therefore use the two-step System -GMM estimator proposed by Blundell and Bond (1998).

3.2. *Data*

The data for this analysis were obtained from three sources of information. First, data from financial statements have been taken from the SABI (Iberian Balance Sheets Analysis System) database, which was developed by Bureau Van Dijk. Second, the market value of equity was extracted from CNMV (Spanish Stock Exchange Commission). Finally, Gross Domestic product data were collected from the Bank of Spain.

Our data consist of non-financial Spanish firms listed on the Spanish Stock Exchange for the period 1997-2004. We have selected firms whose information is available for at least five consecutive years between 1997 and 2004, which is a necessary condition to have a sufficient number of periods to be able to test for second-order serial correlation. We obtained a final panel comprising 60 firms. This sample is representative of the Spanish stock market, since the firms represent 83.52% of the total market value of non-financial Spanish firms. In fact, the *t* test (*p*-value is 0.3624) confirms that there are no

significant differences between the mean market value of our sample and the mean market value of non-financial firms in the Spanish stock market for the period analyzed. Neither are there significant differences between our sample and the non-financial firms in the Spanish stock market for the *Net Trade Cycle* variable (*p*-value of *t*-test of -1.5076) and for the variable WCR to total assets (*p*-value of *t*-test of 0.5437).

Table 1 reports the median values of Net Trade Cycle by sector and year. We observe that the Net Trade Cycle differs between sectors, thus supporting the industry effect on the firms' working capital management suggested by earlier studies (Weinraub and Visscher 1998; Filbeck and Krueger 2005). The longest Net Trade Cycle during our period of analysis is found in retail trade (162.19 days). In contrast, transport and public services (37.99 days) has the shortest. On the other hand, we can see how the NTC has been reduced in all sectors from 1997 to 2004, except in agriculture and mining.

INSERT TABLE 1

In table 2 we can observe the importance of current assets and liabilities as well as WCR by sector of activity. In addition, we also present the median values of the individual components of our dependent variable. The high value of current assets over the total assets in the majority of sectors indicates the importance of managing them efficiently. So, the largest investments in current assets over the total assets are in construction (72.7%) and retail trade (67.8%). With regard to the median periods by sector, we can see that firms dedicated to the agriculture and mining take least time to collect payments from their customers and are also the first to pay their suppliers. In contrast, firms from the construction sector grant their customers the longest payment period and take the longest to pay their suppliers. In relation to stock, storage time is longest in wholesale trade, while the shortest is in transport and public services.

INSERT TABLE 2

Finally, table 3 summarizes the descriptive statistics of our sample and a correlation matrix is presented in Table 4. We can see that the mean (median) Net Trade Cycle in our sample is 115.19 days (91.46 days).

INSERT TABLE 3

INSERT TABLE 4

4. Empirical evidence

4.1. *Convergence toward the target*

Before estimating the model (3), we try to check whether firms modify their WCR to move towards their target. To do so, we follow Flannery and Rangan (2006), and Figure 1 shows firm's NTC decisions according to their deviation from their estimated target NTC. In particular, for each year between 1997 and 2004, we sort firms into quartiles on the basis of their deviations from target Net Trade Cycle (NTC*-NTC). These quartiles are represented on the horizontal axis in Figure 1. Thus, we can observe that the firms in Quartile 1 and Quartile 2 have a longer mean NTC than their target by a mean of 58.33 days and 8.45 days, respectively. Conversely, firms in Quartile 3 and Quartile 4 have a shorter mean NTC than their target by a mean of 11.71 days and 49.23 days respectively according to our model. The vertical axis represents the subsequent year's change in Net Trade Cycle, which should reflect the adjustment of firms towards their target if they actually follow a partial adjustment model. We find that firms in Quartile 1 and Quartile 2 reduce their NTC the following year by a mean of 5.15% and

2.34% respectively. Conversely, firms in Quartile 3 and Quartile 4 increase their NTC by a mean of 0.84% and 2.09%, respectively, during the subsequent year. Therefore, we find that firms adjust towards their targets over time. In other words, our findings are consistent with convergence.

INSERT FIGURE 1

4.2. *Determinants of working capital requirement and speed of adjustment*

Table 5 shows the results of regressing Net Trade Cycle on the different variables explained above. To confirm the robustness of our results we present the estimation of equation (3) using alternative proxies for some independent variables. The m_2 statistic and the Hansen test also are presented. The m_2 statistic indicates there is no second-order serial correlation, and the Hansen Test shows the absence of correlation between instruments and error term. We also present the Variance Inflation Factor (VIF) for each independent variable. Our VIF tests are lower than 5, so there is no multicollinarity problem in our sample (Studenmund 1997). In all estimations we control for industry effects.

The results show that the coefficient of the lagged Net Trade Cycle is positive and significant at the 1% level in all the estimations made, which confirms that companies have a target WCR and follow an adjustment process to reach this target[3]. We also find that this coefficient is roughly 0.4 in all the estimations made, indicating a speed of adjustment of $\gamma = 0.6$, which shows that firms actively pursue their target[4]. While adjustment costs hinder immediate rebalancing, this evidence supports the relatively rapid adjustment speeds documented in the literature for short-term financial

management (Peles and Schneller (1989) for financial ratios entailing short-term balance sheet items; Ozkan and Ozkan (2004) for cash holdings; and Garcia and Martinez (2010) for accounts receivable; among others). This quick speed of adjustment might be explained by the fact that firms can modify their short-term financial decisions more easily than their long-term ones. In this line, Peles and Schneller (1989) indicate that current balance sheet items can be changed quite easily even in the short run because they are to a large extent under the firm's control and easier to manipulate. Lee and Wu (1988) also suggest that current items are expected to have lower costs of adjustment than long-term items. In the Spanish case, moreover, this quick speed of adjustment could also be explained by the fact that firms rely heavily on bank financing. WCR decisions reflect not only the desired WCR but also both the costs of deviating from the target investment and the costs of adjusting towards that target. Since a positive NTC needs to be financed, it indicates a need for funds that firms have to finance. Therefore, the speed of adjustment with which a firm adjusts towards its target NTC may also depend on the transaction costs to be faced. In Spain, firms operate in a banking-oriented financial system, where capital markets are less developed and banks play an important role (Schmidt and Tyrell 1997), so companies have great bank dependence. Indeed, as Miguel and Pindado (2001) state, given the relatively low level of development of the Spanish bond market, firms rely heavily on bank financing, which has lower transaction costs and may allow firms to adjust their actual NTC to their target better.

The results for the rest of the independent variables are consistent with our hypotheses. In particular, findings suggest that firms that are capable of generating more internal funds have a greater WCR. This investment is also greater when economic growth is

higher. In contrast, our findings show that cost of external financing, growth opportunities, investment in fixed assets, probability of financial distress and profitability affect WCR negatively. However, we do not find support for the hypothesis that size influences the WCR held by firms. This result also holds if we estimate the model including the square of size (column 2)[5].

INSERT TABLE 5

5. Impact of external finance constraints and bargaining power on speed of adjustment.

The results obtained in the previous section indicate that, although firms move towards their target Net Trade Cycle, they do not immediately offset deviations from targets because of adjustment costs. However, the model developed in the previous section assumes that all firms within the sample adjust at the same speed and it does not capture the possible differences in the speed of adjustment depending on the firm's characteristics.

In this section we examine the speed of Net Trade Cycle adjustment toward the target according to the ability of the firms to obtain external finance and to their bargaining power. The speed at which firms adjust their current NTC to their target depends on the relative costs of being off their targets compared to the cost of adjustment, so firms with lower adjustment costs adjust more rapidly.

NTC can be adjusted by modifying the accounts receivable, inventories or accounts payable. A greater NTC needs to be financed and, hence, it might lead to more interest expenses and credit risk. In contrast, a lower NTC could be detrimental to the sales of the firm. Accordingly, we expect that speed of adjustment will not be equal across all firms and will depend on both external finance constraints of a firm and its market power. We expect that firms with more access to external capital markets will adjust more quickly because they could modify their NTC more easily. Since firms with greater market power could modify their NTC with little repercussion on their relationships with suppliers, and could pay a lower penalty in terms of sales drop when they reduce the credit extend to their customers (Hill et al., 2010), we also expect these firms to have a greater speed of adjustment.

In order to compare the possible difference in the rate of adjustment, we define dummy variables that allow us to distinguish between firms according to their access to external finance and bargaining power. First, we use the financial constraint index constructed by Whited and Wu (2006), where a greater index means a firm has less access to external capital markets[6]. We create the Whited and Wu index dummy, $WWD_{i,t}$, which takes the value 1 for firm-year observations with better access to external finance, and 0 otherwise. To give robustness to our results, we use the 25th and 50th percentile as well as the mean value of the Whited and Wu index to distinguish firms according to their access to external finance. Secondly, as measure of bargaining power we use the ratio of a firm's annual sales to the total annual sum of sales in a given industry. This variable is used by Hill et al., (2010) as a proxy for a firm's ability to negotiate bilaterally as both customer and supplier, with a higher ratio indicating a greater bargaining power. Thus, we define the bargaining power dummy, $BPD_{i,t}$, which takes the value 1 for firm-year

observations with a higher bargaining power, and 0 otherwise. We also successively use the 25th and 50th percentile, and the mean value of this variable in order to classify firms according to their bargaining power. We then allow these dummies to interact with the lagged variable and obtain the following equations to capture those dynamics of NTC adjustments which cannot be captured by the model developed in section 3:

$$NTC_{i,t} = \alpha + (\rho_0 + \rho_1 WWD_{i,t})NTC_{i,t-1} + \delta_1 CFLOW_{i,t} + \delta_2 FCOST_{i,t} + \delta_3 GROWTH_{i,t} + \delta_4 SIZE_{i,t} + \delta_5 FA_{i,t} + \delta_6 ZSCORE_{i,t} + \delta_7 PRO_{i,t} + \delta_8 GDP_{i,t} + \eta_i + \lambda_i + \upsilon_{i,t} \quad (4)$$

$$NTC_{i,t} = \alpha + (\rho_0 + \rho_1 BPD_{i,t})NTC_{i,t-1} + \delta_1 CFLOW_{i,t} + \delta_2 FCOST_{i,t} + \delta_3 GROWTH_{i,t} + \delta_4 SIZE_{i,t} + \delta_5 FA_{i,t} + \delta_6 ZSCORE_{i,t} + \delta_7 PRO_{i,t} + \delta_8 GDP_{i,t} + \eta_i + \lambda_i + \upsilon_{i,t} \quad (5)$$

Therefore, in equation (4), ρ_0 and $(\rho_0+\rho_1)$ measure the speed of adjustment for firms with more difficulties to obtain external funds (i.e. when $WWD_{i,t}$ takes the value 0) and for firms with a better access to external capital markets (i.e. when $WWD_{i,t}$ takes the value 1), respectively. Since the smaller the coefficient on the lagged NTC, the faster the speed of adjustment, we expect ρ_0 to be higher than $(\rho_0+\rho_1)$. This would indicate that firms with more facilities to obtain external finance move towards their target more quickly. In equation (5), ρ_0 and $(\rho_0+\rho_1)$ measure the rate of adjustment of companies with lower bargaining power (i.e. when $BPD_{i,t}$ takes the value 0) and of firms with higher bargaining power (i.e. when $BPD_{i,t}$ takes the value 1), respectively. Thus, we expect ρ_0 to be greater than $(\rho_0+\rho_1)$, since it would confirm our hypothesis that firms

with a greater bargaining power have lower costs of adjustment and, hence, move towards their target more quickly.

The results, presented in Table 6, are consistent with our hypothesis that speed of adjustment is not equal across all firms and that it depends on both access to external capital markets and firms' bargaining power. On the one hand, we find that estimated adjustment speed for firms with better access to external finance is significantly greater than that of firms with less access external capital markets, since in equation (4) the coefficient ρ_0 (which takes the value of 0.4428; 0.4388 and 0.4420, respectively) is significantly higher than the coefficient $\rho_0+\rho_1$ (0.147, 0.2619, and 0.2468) for the different estimations. This may indicate, as we commented above, that firms with a better access to external finance face lower costs of adjustment when we modify the individual components of WRC[7]. On the other hand, with regard to the influence of bargaining power on the rate of adjustment, we also find that firms with a greater bargaining power adjust more quickly due to their greater facilities to modify the individual components of WCR. We can see that, in equation (5) the coefficient ρ_0 (0.6248, 0.5390, and 0.5747, respectively) is significantly higher than the coefficient $\rho_0+\rho_1$ (0.2990, 0.2401, and 0.1912). Finally, we would like to mention that our results are maintained when we also include intercept effects of access to external finance and bargaining power (results not presented but available from the authors upon request).

INSERT TABLE 6

6. Conclusions

This paper extends the empirical evidence on the WCR in several important dimensions, including the treatment of unobservable heterogeneity and endogeneity problems. We assume that firms have a target WCR and we examine the determinants of current WCR in the presence of adjustment costs. The proposed model is corroborated using a sample of non-financial Spanish companies over the period 1997-2004, which allows us to contribute to the debate on the usefulness of the partial adjustment model in understanding the firm's WCR decisions.

Our findings show that the speed with which firms adjust toward their target WCR is relatively quick, which is consistent with the idea that current balance sheet items could be changed quite easily, even in the short run, because they are to a large extent under the firm's control and are easier to manipulate. Moreover, we present evidence that the speed of adjustment is not equal across all firms. We find that both a firm's access to external capital markets and bargaining power affect how quickly it moves toward its target WCR.

The results also indicate that companies that are capable of generating more internal funds have greater WCR. Our findings also show that cost of external financing, growth opportunities, investment in fixed assets, probability of financial distress, and profitability negatively affect WCR. Finally, we also find that when economic growth is higher, companies have greater WCR.

Further research focused on similar studies in countries with different institutional characteristics and financial systems would appear appropriate, since the speed of adjustment and the effect of explanatory variables on WCR might be different.

Additionally, considering the growing literature about the firm's excess cash holding and since our results suggest that the speed of adjustment is higher for firms with better access to external markets, it may also be of interest to analyze whether the speed of adjustment of WCR is related with excess cash. It could be expected that firms which hold an excess of cash will also adjust to their target WCR level more quickly. However, this is a research question which needs to be studied thoroughly.

Notes

1 The tangible fixed assets are measured as a stock variable.

2 ZSCORE is defined as the following expression:

$$ZSCORE_{it} = 0.104*X_1 + 1.010*X_2 + 0.106*X_3 + 0.003*X_4 + 0.169*X_5$$

where X_1 = Working capital / Total assets; X_2 =Retained earnings / Total assets; X_3 = Net operating profits /Total assets; X_4 = Market value of capital / Book value of debt; and X_5 = Sales / Total assets.

3 We also find a partial adjustment process when employing other more general measures of working capital as the ratio (current assets - accounts payable) / total assets; and the ratio ((current assets – accounts payable)/sales)*365.

4 Following Flannery and Rangan (2006) we simulated 20 sets of panel data, each with 400 observations, and re-estimated our partial adjustment model for them. We obtained a mean speed of adjustment of 0.6326 and a standard deviation of 0.0118.

5 The results presented in Table 5 are maintained when GDP is replaced by interest rate and when both variables are included in the model.

6 The Whited and Wu (2006) index is given by:

$$-0.091CF_{it} - 0.062DIVPOS_{it} + 0.021TLTD_{it} - 0.044LNTA_{it} + 0.102ISG_{it} - 0.035SG_{it}$$

CF is the ratio of cash flow to total assets; DIVPOS is a dummy variable that takes the value of one if the firm pays cash dividends; TLTD is the ratio of the long-term debt to total assets; LNTA is the natural logarithm of total assets; ISG is the firm's industry sales growth; and SG is firm sales growth.

7 We also find that firms with a greater access to external capital markets adjust faster when we employ other measures of access to external finance such as size, interest coverage, and the deviation of a firm's debt ratio from the industry median.

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Figure 1: Subsequent year's change in NTC

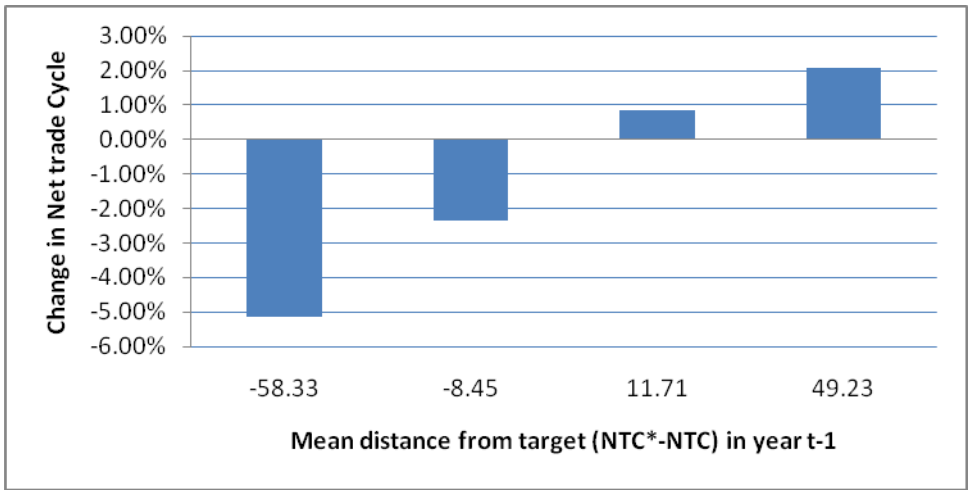

Table 1. Median values of Net Trade Cycle by year and sector

	1997	1998	1999	2000	2001	2002	2003	2004	1997-2004
Agriculture and Mining	53.36	61.34	219.93	187.08	173.19	185.38	181.28	135.22	72.85
Manufacturing	92.17	111.95	116.42	107.40	91.16	90.16	106.55	91.49	100.35
Construction	73.33	83.25	79.20	70.87	63.20	66.58	47.44	58.20	70.23
Wholesale trade	138.60	117.62	165.66	93.45	97.77	106.01	106.70	118.45	112.12
Retail trade	208.40	186.33	126.03	127.99	135.18	132.96	136.66	142.89	162.19
Services	132.05	160.19	96.45	88.61	85.87	59.77	79.59	83.87	89.78
Transport and public services	46.51	67.65	34.52	43.32	41.45	17.55	16.84	23.35	37.99
Total	90.12	96.9	97.51	92.73	88.19	89.70	85.80	84.98	91.46

Note: The Net Trade Cycle is calculated as ((accounts receivable + inventories - accounts payable)/sales)*365

Table 2. Firms' characteristics by sector of activity

	AR	INV	AP	CA/TA	CL/TA	WCR/TA
Agriculture and Mining	69.69	21.75	26.61	0.244	0.242	0.118
Manufacturing	104.34	59.47	54.52	0.456	0.325	0.229
Construction	176.05	37.42	146.72	0.727	0.595	0.155
Wholesale trade	77.16	88.83	50.28	0.573	0.576	0.313
Retail trade	152.21	73.54	49.23	0.678	0.245	0.465
Services	106.72	50.44	51.34	0.475	0.366	0.168
Transport and public services	93.41	6.87	66.94	0.165	0.245	0.035
Total	111.55	53.11	58.63	0.503	0.348	0.212

Note: This table shows the median value of firms' characteristics by sector of activity. AR is the ratio (accounts receivable / sales)*365; INV the ratio (inventories / sales)*365; AP the ratio (accounts payable / sales)*365; CA/TA is the ratio current assets to total assets; CL/TA the ratio current liabilities to total assets; WCR/TA is the ratio accounts receivable plus inventories minus accounts payable to total assets.

Table 3. Summary of Statistics

	Mean	Std. Dev	Min	Median	Max
NTC	115.19	96.506	-29.73	91.46	590.91
CFLOW	0.1687	0.1279	-0.053	0.1303	0.7371
$FCOST_1$	0.0593	0.0411	0.0048	0.050	0.3772
$FCOST_2$	0.0411	0.02767	0.0025	0.0363	0.2206
$GROWTH_1$	1.3836	0.7360	0.5758	1.1650	5.5831
$GROWTH_2$	2.074	2.2875	0.1546	1.4696	2.0257
ASSETS	4,276,179	11,700,000	14,882	403,551	91,800,000
FA	0.5059	0.2172	0.0711	0.4967	0.9872
ZSCORE	0.3035	0.1575	0.0179	0.2899	0.7285
PRO_1	0.0706	0.0509	-0.1222	0.0633	0.3181
PRO_2	0.1094	0.1070	-0.1443	0.0861	0.6975
GDP	0.0382	0.0079	0.024	0.036	0.05

Note: NTC represents the Net Trade Cycle; CFLOW the cash flows generated by the firm; $FCOST_1$ and $FCOST_2$ the cost of external finance; $GROWTH_1$ and $GROWTH_2$ the growth opportunities; ASSETS the total assets in thousands of euro; FA the investment in fixed assets; ZSCORE the probability of financial distress; PRO_1 and PRO_2 the profitability; and GDP the Gross Domestic Product growth.

Table 4. Correlation matrix

	NTC	CFLOW	$FCOST_1$	$FCOST_2$	$GROWTH_1$	$GROWTH_2$	SIZE	FA	ZSCORE	PRO_1	PRO_2	GDP
NTC	1.000											
CFLOW	-0.046	1.000										
$FCOST_1$	-0.083*	-0.062	1.000									
$FCOST_2$	-0.017	0.088*	0.871***	1.000								
$GROWTH_1$	-0.045	0.218***	-0.008	-0.009	1.000							
$GROWTH_2$	-0.128***	0.098**	-0.128***	-0.150***	0.877***	1.000						
SIZE	-0.501***	0.283***	-0.114**	-0.033	-0.017	0.072	1.000					
FA	-0.308***	0.609***	-0.123***	0.133***	0.011	-0.090*	0.479***	1.000				
ZSCORE	0.433***	-0.411***	0.119**	0.009	-0.028	-0.021	-0.529***	-0.682***	1.000			
PRO_1	-0.139***	0.454***	0.046	0.047	0.385***	0.324***	0.046	0.025	0.179***	1.000		
PRO_2	-0.023	0.947***	-0.064	0.035	0.219***	0.094**	0.220***	0.447***	-0.297***	0.543***	1.000	
GDP	0.099**	0.077	-0.009	-0.010	0.068	0.044	-0.066	-0.081*	0.042	0.078	0.103**	1.000

*Indicates significance at 10% level.
**indicates significance at 5%level.
***indicates significance at 1% level.

Table 5. Determinants of Net Trade Cycle

	(1)	(2)	(3)	(4)	(5)	VIF
NTC_{it-1}	0.3986*** (3.79)	0.3982*** (3.80)	0.3918*** (3.73)	0.4064*** (3.77)	0.4303*** (4.27)	1.58
CFLOW	241.693** (2.39)	240.365** (2.28)	242.014** (2.37)	257.941** (2.32)	454.435** (2.36)	2.80
$FCOST_1$	-289.709*** (-2.76)	-289.195*** (-2.79)	-328.308*** (-3.03)	-	-310.704*** (-2.62)	1.03
$FCOST_2$	-	-	-	-250.953* (-1.72)	-	
$GROWTH_1$	-14.585** (-2.28)	-14.423** (-2.17)	-	-15.2322** (-2.41)	-22.7312*** (-2.91)	1.22
$GROWTH_2$	-	-	-4.357** (-2.23)	-	-	
SIZE	-5.7109 (-1.18)	-11.6391 (-0.24)	-3.3226 (-0.79)	-5.0272 (-1.15)	-4.9016 (-1.11)	1.68
$(SIZE)^2$	-	0.2189 (0.12)	-	-	-	
FA	-85.205** (-2.42)	-85.1811** (-2.19)	-84.7424** (-2.07)	-82.1451** (-2.15)	-116.122** (-2.30)	2.70
ZSCORE	166.236*** (2.93)	166.078*** (2.88)	174.656*** (3.16)	163.962*** (2.64)	113.393* (1.94)	2.67
PRO_1	-436.086*** (-3.07)	-435.319*** (-3.05)	-472.546*** (-3.31)	-456.867*** (-3.01)	-	2.11
PRO_2	-	-	-	-	-377.504** (-2.23)	
GDP	5.6666* (1.75)	5.6302* (1.73)	6.1676* (1.90)	6.2451* (1.78)	5.7667 (1.52)	1.04
Constant	130.245 (1.50)	169.891 (0.49)	88.882 (1.24)	107.906 (1.44)	134.192 (1.58)	
m_2	-0.51	-0.51	-0.51	-0.45	-0.46	
Hansen Test	51.04(287)	50.99(286)	51.58(287)	48.94(287)	53.18(287)	
Observations	442	442	442	442	442	

Note: NTC represents the Net Trade Cycle; CFLOW the cash flows generated by the firm; $FCOST_1$ and $FCOST_2$ the cost of external finance; $GROWTH_1$ and $GROWTH_2$ the growth opportunities; SIZE the size; $(SIZE)^2$ the square of size; FA the investment in fixed assets; ZSCORE the probability of financial distress; PRO_1 and PRO_2 the profitability; and GDP the Gross Domestic Product growth.
Z statistic in brackets.
* Indicates significance at 10% level, ** indicates significance at 5% level, *** indicates significance at 1% level.
m_2 is a serial correlation test of second-order using residuals of first differences, asymptotically distributed as N(0,1) under null hypothesis of no serial correlation. The Hansen test is a test of over-identifying restrictions distributed asymptotically under null hypothesis of validity of instruments as Chi-squared. Degrees of freedom in brackets.
VIF represents the Variance Inflation Factor for each independent variable.

Table 6. Impact of external finance constraints and bargaining power on speed of adjustment

	Access to finance			Bargaining power		
	25th	50th	Mean	25th	50th	Mean
NTC_{it-1}	0.4428*** (3.60)	0.4388*** (3.27)	0.4420*** (3.30)	0.6248*** (8.07)	0.5390*** (6.92)	0.5747*** (7.15)
WWD_{it}*(NTC_{it-1})	-0.2958*** (-3.19)	-0.1769* (-1.87)	-0.1952** (-2.01)			
BPD_{it}*(NTC_{it-1})				-0.3258*** (-4.69)	-0.2989*** (-3.82)	-0.3835*** (-5.14)
$CFLOW_{it}$	232.4827** (2.22)	233.0314** (2.17)	211.488** (2.00)	149.8908* (1.67)	195.7234* (1.84)	196.1008** (1.97)
$FCOST_{it}$	-291.8575** (-2.49)	-302.920*** (-2.66)	-281.8056*** (-2.57)	-213.3786** (-2.42)	-293.955*** (-2.56)	-297.3282** (-2.49)
$GROWTH_{it}$	-13.9950* (-1.75)	-14.3170** (-2.05)	-15.7468** (-2.39)	-12.3355** (-2.50)	-9.3707* (-1.93)	-10.2570** (-2.02)
$SIZE_{it}$	-1.9013 (-0.41)	-2.8702 (-0.54)	-2.7113 (-0.51)	-2.1843 (-0.52)	-1.4191 (-0.29)	-2.8383 (-0.70)
FA_{it}	-70.3224* (-1.75)	-89.1861** (-2.48)	-81.2214** (-2.45)	-71.9851** (-2.45)	-74.8660** (-2.22)	-81.7945** (-2.36)
$ZSCORE_{it}$	160.2623** (2.46)	146.966** (2.20)	147.5688** (2.12)	122.817*** (2.61)	141.0543*** (2.87)	101.6377** (2.09)
PRO_{it}	-359.8077** (-2.41)	-316.9105* (-1.84)	-287.4862 (-1.44)	-294.2971** (-2.22)	-388.8281** (-2.55)	-358.8499** (-2.16)
GDP	4.8597 (1.45)	4.0680 (1.16)	5.1633* (1.64)	4.3332 (1.27)	3.7516 (1.06)	4.5770 (1.28)
Constant	74.9487 (0.85)	106.9784 (1.16)	95.6616 (1.05)	108.0649 (1.53)	86.6483 (1.06)	105.8436 (1.61)
F-test	4.48	12.21	11.81	14.90	12.58	17.57
m_2	-1.11	-0.69	-0.81	-0.57	-0.71	-0.84
Hansen Test	48.37(287)	49.48(287)	49.77(287)	45.20(287)	47.10(287)	45.26(287)
Observations	442	442	442	442	442	442

Note: NTC represents the Net Trade Cycle; $WWD_{i,t}$ is a dummy variable equals 1 for firm-year observations with better access to external finance; $BPD_{i,t}$ is a dummy variable equals 1 for firm-year observations with a higher bargaining power; CFLOW indicate the cash flows generated by the firm; FCOST the cost of external finance; GROWTH the growth opportunities; SIZE the size; FA the investment in fixed assets; ZSCORE the probability of financial distress; PRO the profitability and GDP the gross domestic product growth.
Z statistic in brackets.
F-test refers to an F test on the null hypothesis that the coefficient $\rho_0 + \rho_1$ is zero.

* Indicates significance at 10% level, ** indicates significance at 5% level, *** indicates significance at 1% level.
m_2 is a serial correlation test of second-order using residuals of first differences, asymptotically distributed as N(0,1) under null hypothesis of no serial correlation. The Hansen test is a test of over-identifying restrictions distributed asymptotically under null hypothesis of validity of instruments as Chi-squared. Degrees of freedom in brackets.